

**What is claimed is:**

~~1. A telephone network system for providing call management services in a~~  
private network comprising in combination:

at least one trunk gateway in communication with a Public Switched  
5 Telephone Network;

at least one residential gateway in communication with a plurality of  
private users;

at least one call agent in communication with said at least one trunk  
gateway and said at least one residential gateway for processing a plurality of calls to and from  
the Public Switched Telephone Network and a plurality of requests received for a plurality of  
user names at said gateway;

a directory server coupled to the at least one call agent, the directory  
server translating in both directions, as appropriate between a network address corresponding to  
a first user name from said plurality of user names and a customer address for requests within the  
plurality of private users;

a domain name server coupled to the at least one call agent, the domain  
name server translating the Network Address to an Internet Protocol address; and

a portability server coupled to the at least one call agent, the portability  
server allowing a user to move between a plurality of locations with full porting of personalized  
20 features and functions.

2. The telephone network system of claim 1, further comprising a router in communication with the at least one call agent, the directory server, the portability server and the domain name server.

5 3. The telephone network system of claim 1, further comprising an Internet Protocol server to locate a person with in a plurality of network systems.

4. The telephone network system of claim 3, wherein the Internet Protocol server comprises one of at least a session initiation protocol redirection server and a proxy server.

5. The telephone network system of claim 1, wherein the at least one trunk gateway, the at least one residential gateway and the at least one call agent communicate using a client to agent protocol whereby each call agent controls the functionality of the intended gateway.

6. The telephone network system of claim 5, wherein the client to agent protocol is a Media Gateway Control Protocol.

7. The telephone network system of claim 1, wherein the residential and trunk  
20 gateways communicate with each other using a Real Time Protocol.

8. The telephone network system of claim 1, wherein the at least one trunk gateway and at least one signaling gateway, and a combination of trunk and signaling gateway communicates with the Public Switched Telephone Network using at least one of, Signaling System 7 (SS7) Circuit Switched Trunks, Integrated Services Digital Network (ISDN) basic/primary rate trunks, and at least one of SS7 signaling links and ISDN primary rate integrated signaling.

9. The telephone network system of claim 1, wherein the directory server determines if the plurality of requests are one of a Public Switched Telephone Network request and a request from one of the plurality of private users.

10. The telephone network system of claim 1, wherein the at least one call agent generates network addresses from the plurality of Internet Protocol endpoint addresses .

11. The telephone network system of claim 1, further comprises an Internet Protocol network for communications between residential, trunk, and signaling gateways, call agents, and directory, domain name, and portability servers.

12. The telephone network system of claim 1, wherein the directory server uses instances of objects to represent network and customer addresses, such objects being built up from a library of packaged characteristics and behaviors.

13. The telephone network system of claim 12, wherein a translation in the directory server comprises a cross-reference between an attribute of a network address object and a corresponding attribute of a user profile object, for the purpose of determining a user's personal preferences and privileges.

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14. A method of implementing a telephone network system for providing a private network having call management services for a calling and called party involving multimedia services of all types such as voice, video and call-related data, the method comprising:

receiving a call request at one of a residential and trunk gateway from at least one of a Public Switched Telephone Network and a plurality of private users;

determining the physical location of the called party;

evaluating a set of privileges associated with the calling and called party, and negotiating a set of terminating options supplied by the called party, to establish permission to set up the call and to identify a precise terminating networking address from amongst a plurality of such addresses;

determining an optimum route to set up the call; and

establishing the optimum route and matching the call request with a call at a network termination point of the called party.

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15. The method of claim 14, further comprising:

translating between a network address associated with the call request in a directory server and a customer address for calls between the plurality of private users; and

translating between the network address and an Internet Protocol address in a domain name server.

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16. The method of claim 14, further comprising generating a network address from a user name.

17. The method of claim 14, wherein the step of translating a network address includes the directory server determining if the call request is associated with one of the Public Switched Telephone Network and the plurality of private users.

18. The method of claim 14, further comprising passing the call request from the residential gateway to a call agent.

19. The method of claim 17, wherein the step of determining if the call request is associated with one of the Public Switched Telephone Network and the plurality of private users further comprises determining if the dialed digits are preceded by an escape prefix.

20. The method of claim 14, wherein the step of evaluating a set of privileges comprises evaluating at least one of routing preferences, bandwidth reservation, and overriding a busy status of the called party.

21. A computer readable medium having stored therein a set of instructions for causing a processing unit to execute the steps of the method of claim 14.

5 22. The method of claim 14, wherein if in the step of evaluating an external similar set of privileges it is determined that the called party is in an external telephone network system, launching simultaneous person locator queries to the directory servers of the external telephone network systems.

10 23. The method of claim 15, wherein the directory server further comprises a suite of user specific features such as speed call, selective call forwarding, time-of-day routing, together with associated lists of numbers.

15 24. The method of claim 14, further comprising recognizing and providing a network address to a roaming user using a portability server.

25. A telephone network system for providing a private network comprising in combination:

a Public Switched Telephone Network;

20 an Internet Protocol Network in communication with the Public Switched Telephone Network using at least one of a trunk gateway, a call agent and a router; and

a server-based interface for translating between at least one address on the Public Switched Telephone Network and at least one address on the Internet Protocol Network.

26. The telephone network system of claim 25, wherein the server-based interface includes a directory server, a domain name server, a proxy server and a portability server.

27. The telephone network system of claim 25, wherein the Public Switched Telephone Network and the Internet Protocol Network communicate using instructions provided to the trunk gateway by a client to agent protocol.

28. The telephone network system of claim 27, wherein the client to agent protocol is a Media Gateway Control Protocol.

29. The telephone network system of claim 25, further comprising providing a caller with one of at least reservation of Internet Protocol network bandwidth and continuous performance monitoring of the Internet Protocol network as input to per call routing decisions.

30. A method of implementing a telephone network system for providing a private network comprising:

providing a Public Switched Telephone Network;

providing an Internet Protocol Network in communication with the Public Switched Telephone Network;

translating between at least one address on the Public Switched Telephone Network and at least one address on the Internet Protocol Network using a server-based interface; and

evaluating a set of privileges for a calling party and a called party before  
5 establishing a telephone call.

31. The method of claim 30, wherein the server-based interface includes a directory server, a domain name server, a proxy server and a portability server.

32. A computer readable medium having stored therein a set of instructions for  
10 causing a processing unit to execute the steps of the method of claim 30.

33. The method of claim 30, wherein the step of translating includes translating  
15 between a network address and a customer address using a directory server and translating between the network address and an Internet Protocol address using a domain name server.

34. The method of claim 30, further comprising determining and establishing an optimum route to complete a multimedia call, comprising at least one of a service element such as voice, video and call-related data.

20 35. A method of integrating global Internet Protocol point codes within a private network to a plurality of global addresses per gateway, the method comprising:



assigning a single global Internet Protocol address per customer domain name to at least one gateway;

assigning local Internet Protocol addresses to all endpoints administered by the at least one gateway, such endpoints representing individual Virtual Private Network stations;

using a plurality of modified proxy servers in a person locator service to obviate the need for responses with Internet Protocol addresses;

when providing addressing information via said plurality of proxy servers to entities outside the gateway, providing the Virtual Private Network station's Directory Number as the station's global address; and

when exchanging internal protocol information between said gateways during call setup, providing the local addresses for inclusion as sub-addresses in end-to-end associations.

36. A method of implementing a person locator service that ensures end-to-end bandwidth is available before ringing a called endpoint, the method comprising:

performing the person locator service using a modified proxy server which remains state aware of a call in progress;

reserving access to a terminating endpoint for the call in progress until at least one of a Voice and Video service over Internet Protocol association with bandwidth reservation can be established, said reserving access comprising denying dial tone for call originations and giving all other incoming calls busy treatment;

matching the call in progress data with the actual incoming call before ringing the called endpoint; and

canceling the access reservation if the incoming call is not received within a user-settable interval.

5           <sup>37</sup> 37. A method of deploying a person locator service across a plurality of Virtual Private Networks the method comprising:

allowing at least one foreign user to log onto one of the Virtual Private Networks other than their home Virtual Private Network;

10           registering such users on a Directory Server of the Virtual Private Network under at least one of their own user name and one assigned by the system administrator in case of name conflict with existing internal users;

15           upon receipt of a call for this roaming user at the home Virtual Private Network, sending person locator queries to a plurality of other Virtual Private Networks, as specified in the roaming user's profile;

performing a Directory Server lookup on the supplied user name at the other Virtual Private Networks;

finding the user's name and returning the directory number of an endpoint currently being used at one of the other Virtual Private Networks, where the foreign user is actually located;

20           completing the call to the supplied directory number at the home Virtual Private Network; and

providing the caller with an appropriate message if none of the other Virtual Private Networks responds with a Directory Number.

38. In a telephone network, a method of guaranteeing Quality of Service (QoS), the method comprising:

5                    locating a called party and establishing permission to establish a voice path before attempting to complete a voice path for the call;

                  exchanging all relevant call-related data in a Voice over Internet Protocol signaling message before completing the voice path for the call;

10                    allowing the voice path to be established via circuit switched Public Switched Telephone Network methods, at a customer's option;

                  providing a secure relationship between the Voice over Internet Protocol and Public Switched Telephone Network components and the call, through exchange of a token, such that full Voice over Internet Protocol functionality remains available to the call in progress, even though the voice path is provided by the Public Switched Telephone Network;

15                    in a multimedia call, permitting the voice path to be established via the Public Switched Telephone Network while video, call-related data and other components are conveyed in an end-to-end Internet Protocol association; and

20                    in a multimedia call, allowing a voice only call to be established if the video and call-related data cannot be accommodated due to failure or overload of the Internet Protocol Network.

39. In a telephone network, a method of allowing either calling or called parties to independently use either alphanumeric names or fictitious internal telephone numbers to identify a plurality of other users, the method comprising:

performing lookups using at least one of alphanumeric names and  
5 fictitious internal telephone numbers at a directory server;

normalizing all internal network functions such as matching decisions to  
be based on customer addresses; and

translating user inputs such as one of dialed numbers, entries in user  
profiles, into customer addresses for internal call-processing by means of the directory server.

40. In a telephone network, a method of implementing call management services,  
the method comprising:

using at least one customer address such as one of at least alphanumeric  
names and fictitious telephone numbers, as the means by which called users are identified;

allowing callers to enter the at least one customer address as the dialed  
15 number;

translating a caller's current endpoint identifier to the caller's customer  
address;

providing customized call processing logic and related data in the profiles  
of the called and calling users;

20 accessing the customized elements for use in real-time call processing, as  
required; and

using the customer addresses of the calling and the called parties, whereby routing and matching decisions are based on the users' identity.

41. In a telephone network, a method of implementing portable call processing, the method comprising:

5 assembling a customized call processing sequence for matching and routing decision trees from at least one of a palette of icons and from a menu or table driven equivalent set of options;

storing the customized call processing sequence and related data in a profile of an individual user; and

10 downloading of the call processing sequence and data from the profile to one of at least a real-time data processing server and call agent throughout the telephone network.

42. In a telephone network, a method of providing Session Initiation Protocol bandwidth reservation as a user privilege class, the method comprising:

15 establishing Voice over Internet Protocol associations, as required, with Session Initiation Protocol bandwidth reservation;

providing an option within a calling user's profile that indicates whether or not a user can reserve bandwidth; and

20 providing a real-time process sequence within a routing decision tree to implement bandwidth reservation if appropriate.

43. A telephone network that provides service portability, that allows roaming users to log on as guests at other users' stations within the same Virtual Private Network, the telephone network comprising in combination:

functionally

a portability server to identify and authenticate guest users;

a directory server having a network address object including a plurality of fields to indicate the presence of a guest user; the directory server in communication with the portability server to set a flag in one of the plurality of fields; and

a separate set of procedures in the directory server for handling incoming calls for the station's permanent user when a guest user is present, as indicated by the flag.

44. In a telephone network, a method of allowing roaming users to log on as "foreign users" in Virtual Private Networks other than a home network, the method comprising:

identifying and authenticating guest users using a portability server;

allowing users not recognized by the portability server to log on as foreign users, if permitted by the system administrator;

creating a temporary record in a directory server for the foreign user, under the direction of the portability server;

designing the record to respond to a lookup of the user's name with the directory number of the station currently being used by the foreign user; and

allowing external Session Initiation Protocol queries to access said directory server, perform the lookup, and receive the directory number.

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45. In a telephone network, a method whereby secure matching is provided on a hybrid call that is set up using at least one of Voice and Video over Internet Protocol techniques but completed via the Public Switched Telephone Network , the method comprising:

5 returning a token from a proxy server at a terminating gateway to a call agent in an originating gateway;

saving the token and all pertinent call data for the subsequent Public Switch Telephone Network call at the proxy server;

returning the token to the terminating gateway from the originating gateway, in the call, when a Public Switched Telephone Network voice path is eventually established;

searching a database of calls in progress at the terminating end, obtained from the proxy server, for a match with the token returned; and

aligning the at least one of Voice and Video over Internet Protocol signaling component of the hybrid call with the Public Switched Telephone Network component at both the originating gateway and terminating gateway of the call.

46. The method of claim 45, wherein said token comprises of a long integer which is incremented with each subsequent request for a new token.

20 47. A method using a parameter in the Signaling System 7 Initial Address Message to transmit proprietary end-to-end data within a Virtual Private Network, the method comprising:

establishing a hybrid environment where a voice path for calls can be established via a Public Switched Telephone Network;

determining at the time of setting up a Public Switched Telephone Network call that the destination for the call is within the Virtual Private Network, but at a different gateway;

populating the available characters of the Signaling System 7 parameter in the Initial Address Message with any proprietary data that needs to be sent to the other end, if the destination is within the Virtual Private Network, as determined by a target directory number; and

extracting data from the available characters at the destination, if the source is within the Virtual Private Network, as determined by the calling line identity.

48. The method of claim 47, further includes populating the parameter with calling name information in accordance with the conventional Public Switched Telephone Network if the destination is external to the Virtual Private Network, as determined by the target directory number and wherein the parameter is a generic name parameter.

49. A method of guaranteeing QoS by allowing a private telephone network to function at an acceptable level, even in the face of a total loss of the managed Internet Protocol network, the method comprising:

establishing a hybrid environment where a voice path for a plurality of calls can be established via a Public Switched Telephone Network;



replicating directory servers at each Virtual Private Network node;  
automatically updating data of a directory server at a plurality of nodes  
whenever there is a change in the data;

providing a default routing process sequence that allows calls to complete  
5 via the Public Switched Telephone Network to a terminating gateway even if a set up person  
locator query fails;

recognizing failed internal calls at the terminating node; and  
using a last available version of the local data to make matching and  
routing decisions at the terminating node.

10 50. A method by which users occupying new offices are able to log on with the  
system administrator to implement the move, the method comprising:

responding to call attempts at a directory server from unassigned network  
addresses with the address of the system administrator, regardless of digits dialed;

15 routing such call attempts to the system administrator, without translation  
of the network address;

authenticating the user and assigning a network address to the user  
accordingly by the system administrator; and

broadcasting the new customer address to the network address association  
to all directory servers by the system administrator.